ELECTRONIC APPARATUS WITH FLEXIBLE CABLE INTERCONNECT HAVING INDEPENDENTLY MOVABLE MEMBER SUPPORTED ON TAB PORTIONS

This is a continuation of copending application(s) Ser. No. 08/000,441 filed on Jan. 4, 1993.

TECHNICAL FIELD

This invention relates to electronic apparatus and more particularly to electronic apparatus of the information handling system variety, more commonly referred to as computers. Even more particularly, the invention relates to such computers which are of the portable type, including those often referred to as "laptop" computers.

BACKGROUND OF THE INVENTION

Computers, including those of the portable type, have become well known and are currently in widespread usage in this and many foreign countries. The several advantages associated with such electronic apparatus, especially those of the portable type, are well documented and too numerous to mention here. Examples of such portable computers, including those referred to as "laptop" computers, are described and illustrated in U.S. Pat. Nos. 4,852,033 (Saitou), 4,864,523 (Sasaki), 4,959,887 (Gruenberg et al), 4,986,763 (Boyle) and 5,090,913 (Kobayashi). Typically, such portable computers include a base portion or the like in which are housed various electronic components, including, for example, a keyboard structure, which is usually comprised of a number of key switches and at least one printed circuit board having a matrix of electrical contacts arranged in multiple rows and columns corresponding to the keyboard's switches. Also typically included in such a first, base portion is the computer's central processing unit (CPU), a power supply (for example, a battery), and appropriate storage devices such as a floppy or hard disk. As known, portable computers further typically include a second portion which is movably (for example, pivotally) joined to the first, base portion, usually through some form of hinge mechanism. This second portion performs several functions, including, when closed onto the base portion, serving as a cover for same to thereby protect the otherwise exposed key elements of the keyboard, and also as a holder for a display unit which, when open, will be visible to the computer's user. This display unit can be in the form of a video monitor, liquid crystal display, or the like structure.

Understandably, it is necessary to electrically connect various electronic components, e.g., the keyboard and display, with each other in order for the apparatus to properly operate. In the foregoing and similar structures, such interconnection is usually accomplished using some type of electrical cable, including those often referred to in the industry as flexible cable of relatively flat configuration, also referred to occasionally as flexible circuits. Flexible cables of the flat type provide various advantages over known, round coaxial cabling, including, particularly, increased capacity, and are thus becoming more and more desired in today's computer industry. Problems with providing the above interconnections between the described two portions of a portable computer or similar electronic apparatus have occurred due to the relatively high forces at this coupling and the need for proper positioning of the connecting cable, said problems further exacerbated in view of the industry's increasing demand for miniaturization. The result, as evidenced in some of the above patents, has been hinge mechanisms of relatively complex and/or large design in order to accommodate a nearby cable or even to have the cable extend therethrough. For the latter type structures, the result has also typically involved an extensive bending or twisting of the cable in order to "snake" this element through the structure, thereby adding to the difficulty in assembling (and cost) of the final product. Cable failure might also result, particularly in the presence of the aforementioned relatively high forces.

As will be defined herein, the invention provides an electronic apparatus of the type defined above wherein electrical interconnection between the apparatus's two portions is accomplished in a more expeditious manner than those described in structures such as those found in the above listed patents. The resulting design is relatively easy to fabricate and, significantly, necessitates a minimum of cable bending while assuring ease of hinge operation, cable protection and a pleasing aesthetic appearance for the final product. Of further significance, the invention is particularly compact in design, thus satisfying today's demands for miniaturization. Although the term electronic apparatus is particularly used herein to include portable computers, this term should not be limited to such products, as the teachings of the invention may also be applicable to other electronic apparatus such as electronic calculators, typewriters, etc. which utilize at least two electronic component-containing portions coupled by some form of hinge mechanism or the like and wherein electrical interconnection between such portions is necessary. By the terms cabling or cable as used herein are also meant to include electrical cables of round, flat or other cross-sectional configuration, which may be used to provide such interconnections.

It is believed that an electronic apparatus providing the above advantageous features, as well as others discernible from the teachings herein, will constitute a significant advancement in the art.

DISCLOSURE OF THE INVENTION

It is, therefore, a primary object of the present invention to enhance the electronic apparatus art, and particularly that portion of the art involved with portable and the like computers.

It is another object of the invention to provide an electronic apparatus which includes a cable interconnect structure which provides the above, several advantages, as well as others discernible from the teachings herein.

In accordance with one aspect of the invention, there is provided an electronic apparatus which comprises a first portion (for example, a keyboard and associated electronic structure), a second portion (for example, a display unit and associated electronic structure), hinge means which enables pivotal connection between the two portions, a movable member which is movably positioned on at least part (for example, a protruding tab segment) of both portions and a flexible cable which provides electrical interconnection between the electronic components of the two portions. Significantly, the movable member is capable of independent movement relative to the two parts of the defined two portions during pivotal movement of at least one of these